Ethernet Modbus X80 Gateway Device Type Manager

User Manual

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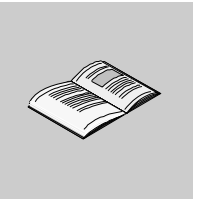

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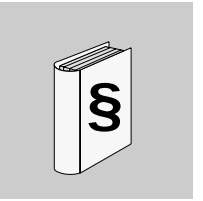
Safety Information



Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠ CAUTION
CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

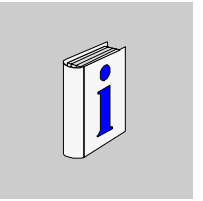
NOTICE
NOTICE is used to address practices not related to physical injury.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

About the Book



At a Glance

Document Scope

This user manual is intended to describe the use of the X80 Gateway Device Type Manager (GW DTM) for Ethernet (Modbus TCP) to Modbus Serial.

Validity Note

This document has been updated with the release of Ethernet Modbus X80 Gateway DTM (EM X80 GW DTM) V1.0.

Product Related Information

⚠ WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines.[1]
- Each implementation of this equipment must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

[1] For additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems" or their equivalent governing your particular location.

User Comments

We welcome your comments about this document. You can reach us by e-mail at techcomm@schneider-electric.com.

Hardware and Software Requirements

1

Introduction

The Ethernet Modbus X80 Gateway DTM (EM X80 GW DTM) is designed to run on various Windows-based operating systems. This chapter describes the computer system requirements and provides instructions for installing and removing the software.

What Is in This Chapter?

This chapter contains the following topics:

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Compatibility	11
Installing and Removing the EM X80 GW DTM	12

System Requirements

Introduction

This section lists the hardware and software requirements of the EM X80 GW DTM.

Hardware Requirements

Your PC needs to meet the following hardware requirements to run the EM X80 GW DTM:

Hardware Component	Minimum	Recommended
Computer	Pentium 4 or equivalent	Core 2 Duo
RAM	1 GB	2 GB
System Drive: Free Hard Drive Space	30 MB	
Installation Drive: Free Hard Drive Space	30 MB	
Swap File	1024 MB	2048 MB
Monitor Display	256 color SVGA 800 x 600 resolution	true color XGA 1024 x 768 resolution

Software Requirements

The EM X80 GW DTM runs on the following operating systems:

Operating System	Edition / Service Pack	Special Considerations
Windows XP Professional	SP3	You need administrator access rights to install the EM X80 GW DTM.
Windows 7 32-Bit	–	
Windows 7 64-Bit	–	
Windows Vista 32-Bit	SP2	

The EM X80 GW DTM requires the following software installed on the PC:

Software	Edition	Special Considerations
Microsoft.NET Framework	V2.0	–
FDT Frame Application	FDT 1.2 or FDT 1.2.1	The EM X80 GW DTM requires an FDT Frame Application compliant with the FDT standard. The FDT Frame Application must support the Microsoft.NET Framework 2.0.

Compatibility

FDT Compatibility

The EM X80 GW DTM is compliant with the FDT Specification V1.2.1 (including FDT 1.2). It is based on the Annex Modbus V1.0.

For further information on FDT, see the website *www.fdtgroup.org*.

Modbus Compatibility

The EM X80 GW DTM supports Modbus services specified in the Modbus Application Protocol specification V1.1b.

Installing and Removing the EM X80 GW DTM

General Information

You need administrator access rights to your computer to install or remove the EM X80 GW DTM.

Installation

To install the EM X80 GW DTM on your computer, double-click the *setup.exe* file and follow the instructions given on screen.

Removal

To remove the EM X80 GW DTM from your computer, choose **Start** →**Settings** → **Control Panel** →**Add / Remove Programs**.

Functional Description

2

What Is in This Chapter?

This chapter contains the following sections:

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2.1 Functional Description

Functional Description

Overview

The EM X80 GW DTM is a Gateway DTM.

It creates a link between the following parties:
- the control network, that is the computer running a Modbus TCP Comm DTM in a standard FDT Frame Application (compliant with the FDT Specification V1.2.1), and
- any device which is delivered with a Device DTM (Device Type Manager) and which supports the Modbus Serial protocol (for example ATV 71)

Communication Functions Provided by the EM X80 GW DTM

The EM X80 GW DTM provides the following functions:
- configuring the address *(see page 27)* of the Modbus Serial master (rack, slot, channel of the Modbus module that is used as master for communications)
- addressing *(see page 28)* of the Modbus slave devices, that are the target devices (for example ATV 71)
- displaying diagnostic information *(see page 30)* on the communication status
- logfile creation *(see page 31)*
- configuration of the scan procedure *(see page 33)* for Modbus target devices

Print Function

The EM X80 GW DTM supports the print function according to the FDT Specification V1.2.1.

This means that the following information is printed when the print function is executed for the EM X80 GW DTM within the FDT Frame Application:
- the current communication configuration and runtime values
- DTMs connected to the EM X80 GW DTM including the information that is available in the address table

2.2 Communication Models

What Is in This Section?

This section contains the following topics:

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Communication Models

Introduction

This chapter provides examples for the different communication models supported by the EM X80 GW DTM.

⚠ WARNING

INVALID DEVICE STATE INFORMATION

Do not use the EM X80 GW DTM for time critical controlling or monitoring tasks because the transferred data may not reflect the actual device state. The FDT Technology is not designed for this purpose.

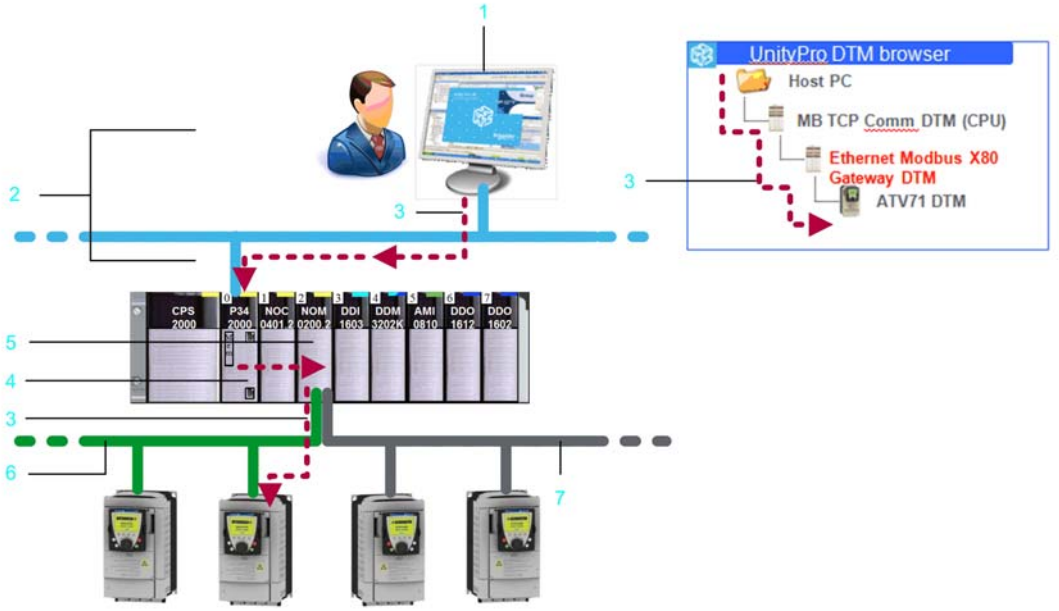
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Example 1: Connection to the Control Network via CPU Module

As shown in the figure below, the connection between the computer running your FDT Frame Application (Unity Pro) and the PLC (Modicon M340) is established via the CPU module (BMX P34 2000) using a Modbus TCP Comm DTM. This communication is performed using the Modbus TCP protocol.

Within the (Modicon M340) rack, the request is routed to the Modbus Serial communication module BMX NOM 0200. This routing function is performed by the EM X80 GW DTM. The EM X80 GW DTM additionally performs the conversion between the Modbus TCP and the Modbus Serial protocol.

The connection between the BMX NOM 0200 and the Modbus Serial target device is established via channel 0 or channel 1 of the BMX NOM 0200 module using the Modbus Serial protocol. The devices are addressed as defined in the **Address table** of the EM X80 GW DTM.

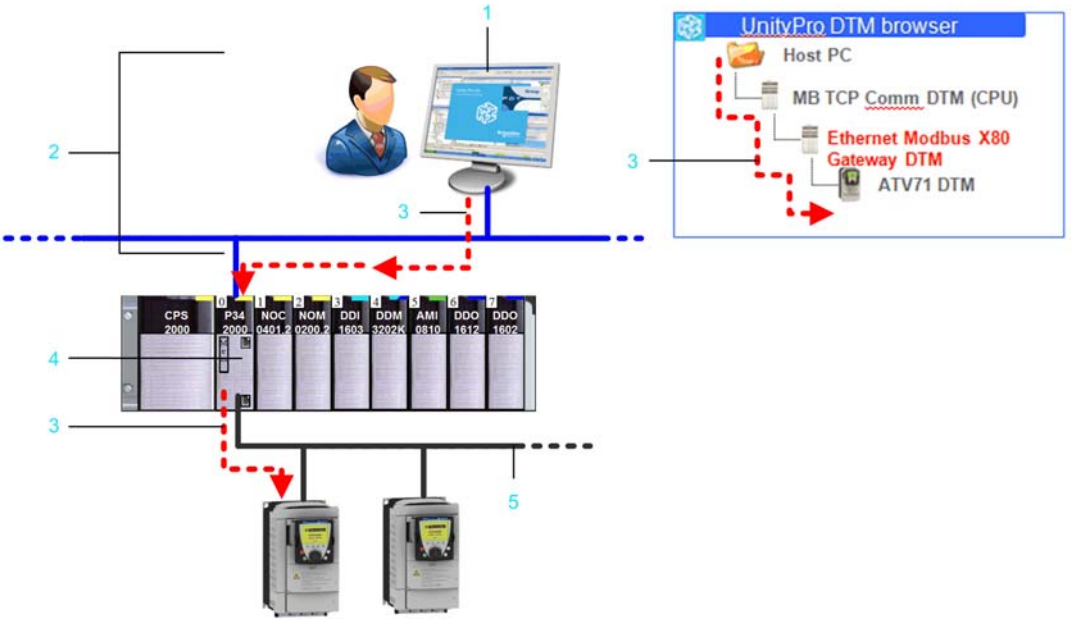


1 computer running Unity Pro
2 control network (Modbus TCP protocol)
3 transparent communication
4 CPU module BMX P34 2000
5 Modbus communication module BMX NOM 0200
6 Modbus SL channel 0
7 Modbus SL channel 1

Example 2: Connection to Control Network and Modbus Target Devices via CPU Module

As shown in the figure below, the connection between the PLC (Modicon M340) and the computer running your FDT Frame Application (Unity Pro) as well as the connection between the PLC (Modicon M340) and the Modbus target devices are both established via the CPU module (BMX P34 2000) of the PLC.

Even though the same module is used, the protocol differs for the 2 connections. The connection between the PLC (Modicon M340) and the computer is established via the Modbus TCP Comm DTM using the Modbus TCP protocol. The connection between the PLC (Modicon M340) and the target devices is established via the Modbus SL channel 0 of the CPU module using the Modbus SL protocol. The EM X80 GW DTM performs the data conversion from the Modbus TCP to the Modbus SL protocol. The target devices are addressed as defined in the **Address table** of the EM X80 GW DTM.



1 computer running Unity Pro
2 control network (Modbus TCP protocol)
3 transparent communication
4 CPU module BMX P34 2000
5 Modbus SL channel

Considerations

Support of FDT Scan on Modbus TCP Network Level

The EM X80 GW DTM was designed in a generic way so that it can be used with different communication models *(see page 16)*.

For this reason, the DTM will not automatically be assigned to a specific device if an FDT scan is performed on the Modbus TCP network level.

In order to add the EM X80 GW DTM to the network topology, explicitly select the EM X80 GW DTM and assign it manually to the node with the corresponding IP address.

DTM Graphical User Interface

3

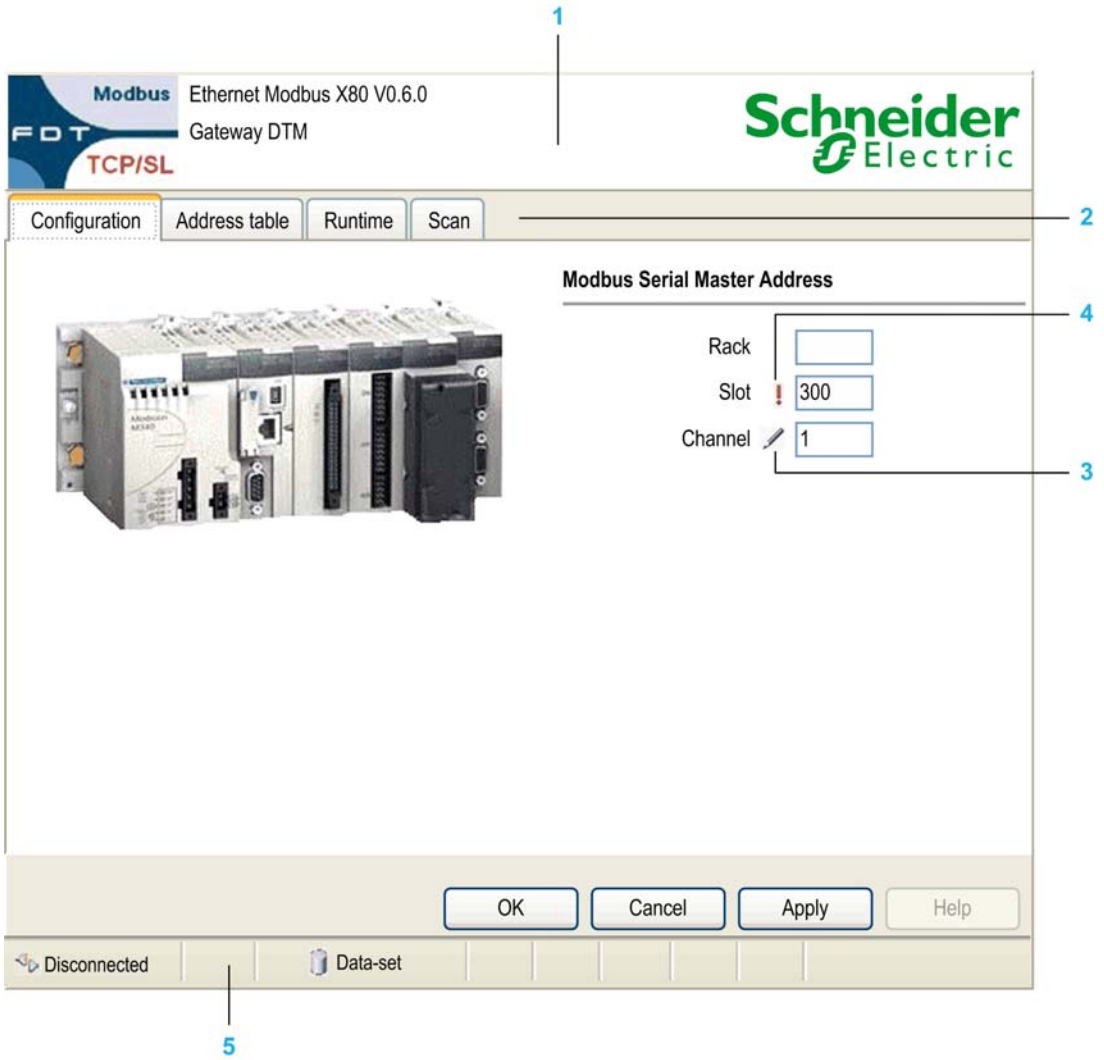
Graphical User Interface

Overview

This chapter describes the graphical user interface (GUI) of the EM X80 GW DTM.

Introduction

The following figure shows the GUI (graphical user interface) of the DTM.



1 Identification area
2 Tab menu
3-4 Parameter status icons
5 Status bar

Identification Area

The identification area shows the name and the version of the DTM.

Tab Menu

Use the tab menu to access the different functions provided by the DTM.

Parameter Status Icons

The parameter status icons provide information about the current state of the parameter.

Possible parameter states

Icon	Meaning
	The parameter was modified and has an invalid value.
	The parameter was modified and has a valid value

Status Bar

The status bar provides information about the current status of the DTM.

Possible connection states

Icon	Text	Meaning	DTM State
	Connecting	connecting	going online
	Connected	connected	online
	Disconnecting	disconnecting	going offline
	Interrupted	interrupted	detected communication interruption
	Disconnected	disconnected	all other states

Possible data source states

Icon	Text	Behavior
	Data set	Displayed values are loaded from the instance data set. Changed values are affected on the instance data set only.
	Data set locked	Displayed values are loaded from the instance data set. Data set is locked.

Configuration

4

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Configuration Tab	26
Address Table	28
Runtime Tab	30
Scan Configuration	33

Configuration Tab

Introduction

Use the **Configuration** tab of the EM X80 GW DTM to configure the address of the Modbus Serial master.

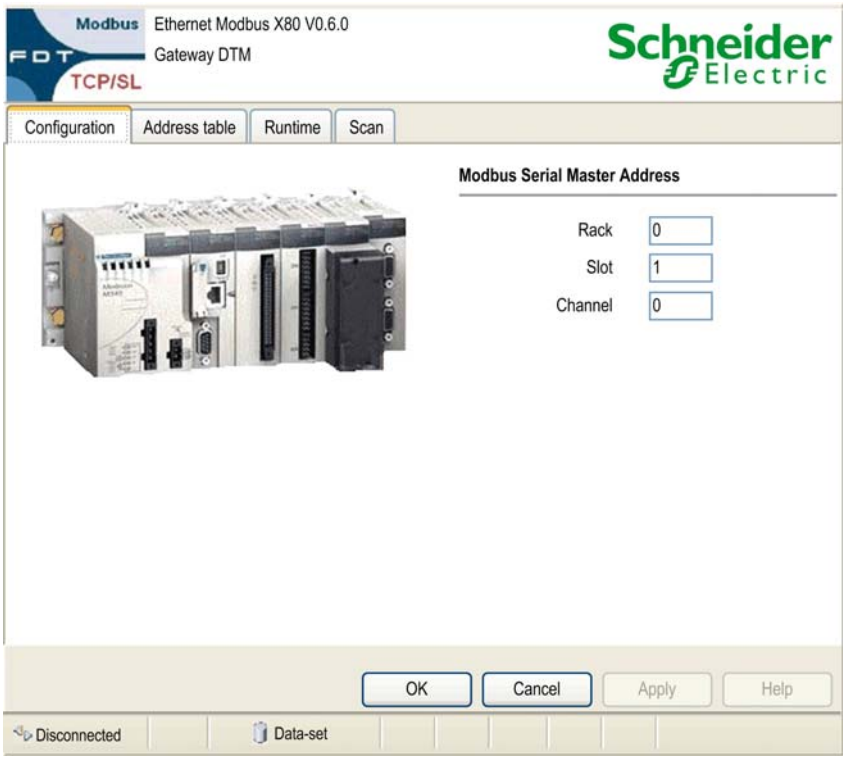
NOTE: Set the EM X80 GW DTM to offline state before modifying the communication parameters.

Configuration Tab

You have several possibilities to access the **Configuration** tab of the EM X80 GW DTM:

- In the network view of your FDT Frame Application, double-click the EM X80 GW DTM icon.
- In the network view of your FDT Frame Application, right-click the EM X80 GW DTM icon and select the **Configuration** command.

The following figure shows the **Configuration** tab of the EM X80 GW DTM dialog box:



Modbus Serial Master Address

Use the **Modbus Serial Master Address** parameters to define the Modbus Serial master in the Modbus network:

Parameter	Description
Rack	Enter the number of the PLC rack where the Modbus Serial master is installed in order to identify the correct rack in your Modbus network.
Slot	Enter the number of the slot where the module, that is used as Modbus Serial master (Modbus communication module or CPU module), is installed in the PLC rack.
Channel	Enter the channel of the selected module that will be used for Modbus SL communications.

Buttons

The following table contains a description of the general configuration buttons that are included in the **Configuration** tab:

Button	Description
OK	The parameter settings will be saved and the EM X80 GW DTM dialog box will be closed. The new parameter settings will be applied at the next connection.
Cancel	The parameter modifications are canceled and the EM X80 GW DTM dialog box will be closed without saving. The original values will be applied at the next connection.
Apply	The parameter settings will be saved but the EM X80 GW DTM dialog box remains open. The new parameter settings will be applied at the next connection.
Help	The context sensitive online help opens.

Address Table

Overview

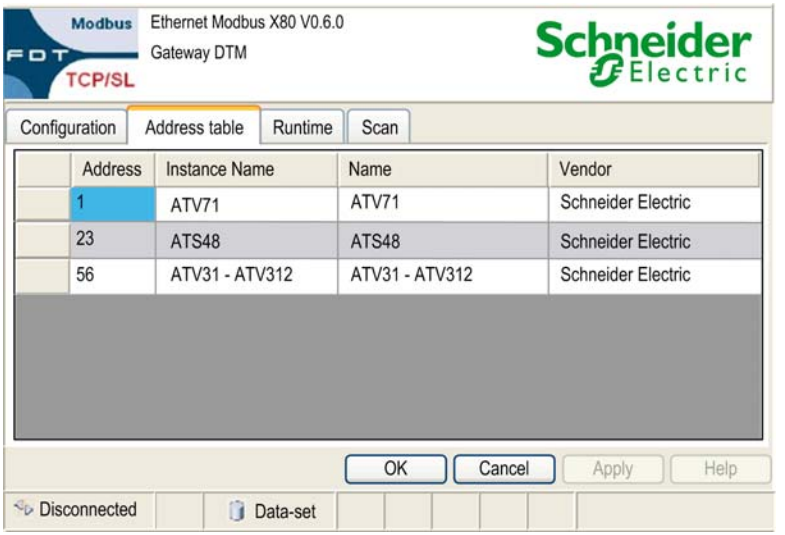
The EM X80 GW DTM provides an **Address table** which lists the connected Device DTMs and their target addresses. This chapter describes the information provided in the address table and the configuration of the slave addresses of the target devices.

Address Table

Open the **Address table** tab as follows:

- In the network view of your FDT Frame Application, double-click the EM X80 GW DTM icon and select the **Address table** tab,
- or right-click the EM X80 GW DTM icon in the network view of your FDT Frame Application, execute the **Configuration** command, and select the **Address table** tab.

The following figure shows the EM X80 GW DTM **Address table** tab:



The EM X80 GW DTM **Address table** tab provides the following information:

Parameter	Description
Address	target address of the hardware device that shall be configured with the connected DTM
Instance Name	name of the DTM instance
Name	name of the DTM
Vendor	name of the DTM's vendor

Modifying Slave Addresses

To modify a slave address, proceed as follows:

Step	Action
1	Click in the **Address** field of the respective slave device to make it editable.
2	Enter the new address number you want to assign to this slave device.
3	Click the **OK** or **Apply** button to save your changes and assign the modified addresses to the Device DTMs.

Buttons

The following table contains a description of the buttons that are included in the **Address table** tab:

Button	Description
OK	The modified address(es) will be saved and assigned to the Device DTMs. The EM X80 GW DTM dialog box will be closed.
Cancel	The address modifications are canceled and the EM X80 GW DTM dialog box will be closed without saving.
Apply	The modified address(es) will be saved and assigned to the Device DTMs but the EM X80 GW DTM dialog box remains open.
Help	The context sensitive online help opens.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- During the address assignment in the address table of the EM X80 GW DTM, you must assure that you assign the correct address of the intended target device.
- Before executing any commissioning tasks with a device DTM, perform operational tests to make sure that you are connected to the intended device.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Runtime Tab

Overview

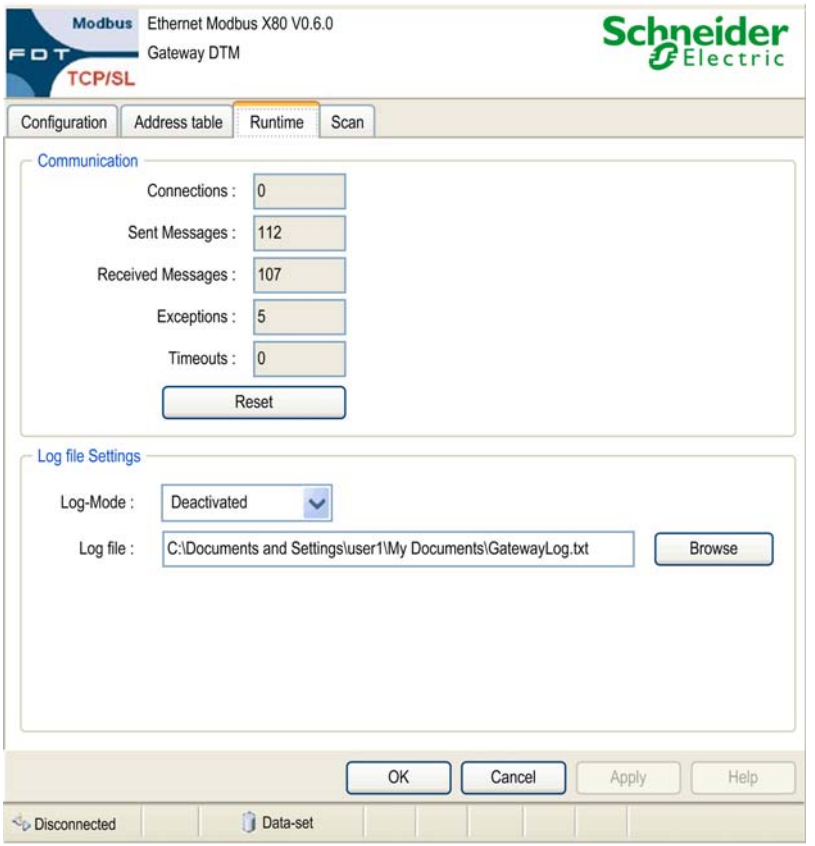
This chapter describes the **Runtime** tab of the EM X80 GW DTM that provides different types of diagnostic information on the established connections and allows you to configure the log function.

Runtime Tab

Open the **Runtime** tab as follows:

- In the network view of your FDT Frame Application, double-click the EM X80 GW DTM icon and select the **Runtime** tab,
- or right-click the EM X80 GW DTM icon in the network view of your FDT Frame Application, execute the **Configuration** command, and select the **Runtime** tab.

The following figure shows the EM X80 GW DTM **Runtime** tab:



Runtime Information

The **Communication** part of the **Runtime** tab indicates the following runtime information:

Information	Description
Connections	number of active connections from the EM X80 GW DTM
Sent Messages	number of messages sent by the EM X80 GW DTM
Received Messages	number of messages received by the EM X80 GW DTM
Exceptions	number of Modbus Exception messages received by the EM X80 GW DTM
Timeouts	number of detected timeout errors on reception

Log File

The EM X80 GW DTM allows to create a log file. The **Log file** text box indicates the path where the log file is stored. To adapt this path, click the **Browse** button.

The following table describes the information which will be written to the log file depending on the selected **Log-Mode**:

Log-Mode	Description
Deactivated	disables the log file feature
Error-Logging	Only information about detected timeout errors and received Modbus exceptions will be written to the log file.
All-Logging	In addition to the information about detected timeout errors and received Modbus exceptions, information about the sent Modbus requests and received Modbus responses, and the requests received from the Device DTM, is written to the log file.

Buttons

The following table contains a description of the buttons that are included in the **Runtime** tab:

Button	Description
Reset	resets the runtime information displayed in this tab to 0
Browse	opens a file browser to specify the log file path
OK	The parameter settings will be saved and the EM X80 GW DTM dialog box will be closed. The new parameter settings will be applied at the next connection.
Cancel	The parameter modifications are canceled and the EM X80 GW DTM dialog box will be closed without saving. The original values will be applied at the next connection.
Apply	The parameter settings will be saved but the EM X80 GW DTM dialog box remains open. The new parameter settings will be applied at the next connection.
Help	The context sensitive online help opens.

Scan Configuration

Introduction

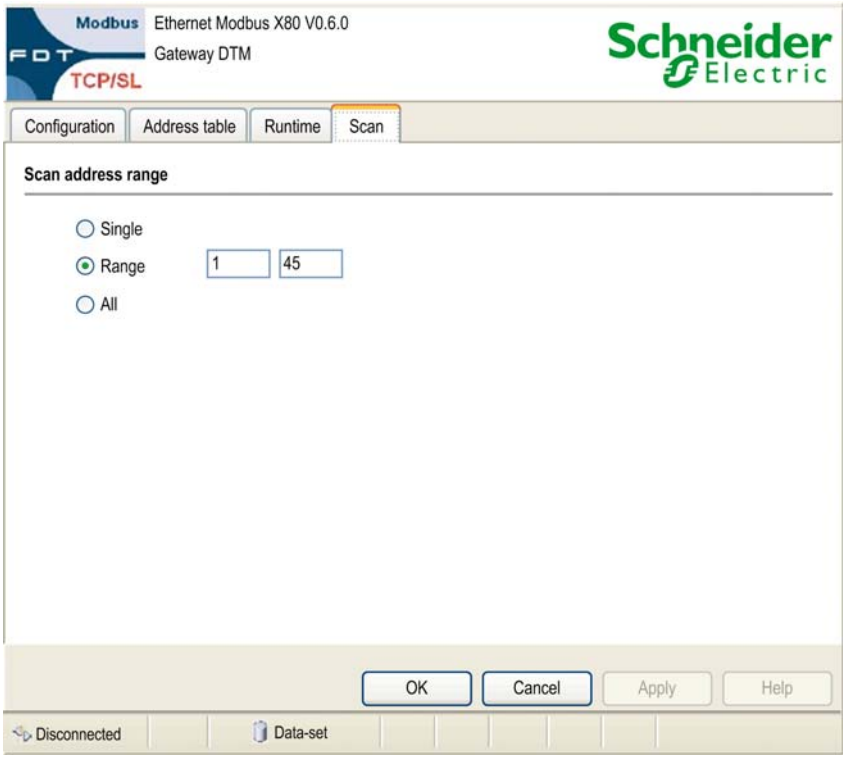
The EM X80 GW DTM allows you to specify the range of the scanned Modbus slave addresses for the FDT scan. The scan function is compliant with the FDT Specification V1.2.1. The scan can be used to build automatically the network topology of the underlying communication network. This chapter describes the parameters provided by the **Scan** tab.

Scan Tab

Open the **Scan** tab as follows:

- In the network view of your FDT Frame Application, double-click the EM X80 GW DTM icon and select the **Scan** tab
- or right-click the EM X80 GW DTM icon in the network view of your FDT Frame Application, execute the **Configuration** command, and select the **Scan** tab.

The following figure shows the EM X80 GW DTM **Scan** tab:



Scan Parameters

The following table contains a description of the scan parameters:

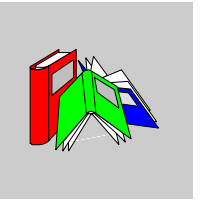
Scan Range	Description	Default Value
Single	Scans only a single address of one slave device in the range between 1-247.	1
Range	Scans a specified address range between 1-247 for slave devices.	1-247
All	The complete address range of the Modbus Serial connection (1-247) is scanned for slave devices.	–

Buttons

The following table contains a description of the buttons that are included in the **Scan** tab:

Button	Description
OK	The modifications will be saved and applied to the next scan procedure. The EM X80 GW DTM dialog box will be closed.
Cancel	The modifications are canceled and the EM X80 GW DTM dialog box will be closed without saving.
Apply	The modifications will be saved and applied to the next scan procedure but the EM X80 GW DTM dialog box remains open.
Help	The context sensitive online help opens.

Glossary



C

Communication DTM

As defined in the FDT specification, the Communication DTM represents a communication device that provides communication capabilities via communication channels (in the sense of FDT) to the connected DTM, but does not require any communication capabilities from a parent DTM.

Based on this definition, the Communication DTM is the DTM type that provides the communication link to a hardware interface on the PC (for example, a COM port) which can be used to access the connected bus and to exchange data between the Device DTMs and their associated hardware devices.

configuration

The arrangement and interconnection of hardware components within a system and the hardware and software selections that determine the operating characteristics of the system.

CRC

cyclic redundancy check.

Messages that implement this error checking mechanism have a CRC field that is calculated by the transmitter according to the message's content. Receiving nodes recalculate the field. Disagreement in the two codes indicates a difference between the transmitted message and the one received.

D

Device DTM

A Device DTM enables to perform commissioning, configuration and engineering tasks for a specific device type. The Device DTM represents a normal field device that uses a communication channel to communicate with the related field device.

DTM

A DTM (Device Type Manager) is a kind of device driver, which is provided by the field device vendor. The DTM contains the device specific information and provides a graphical user interface. The DTM can be used to perform monitoring tasks and configuration tasks on the specific device. A DTM is not a standalone application, it requires an FDT Frame Application to run.

E

Ethernet

A LAN cabling and signaling specification used to connect devices within a defined area, e.g., a building. Ethernet uses a bus or a star topology to connect different nodes on a network.

F

FDT

The FDT (Field Device Tool) technology standardizes the communication interface between field devices and systems (*www.fdtgroup.org*).

function code

A function code is an instruction set commanding 1 or more slave devices at a specified address(es) to perform a type of action, e.g., read a set of data registers and respond with the content.

G

gateway

a program or hardware that passes data between networks

Gateway DTM

As defined in the FDT specification, a Gateway DTM is a Communication DTM that provides communication capabilities via communication channels (in the sense of FDT) and requires communication capabilities from a parent DTM.

I

IP

internet protocol.

That part of the TCP/IP protocol family that tracks the internet addresses of nodes, routes outgoing messages, and recognizes incoming messages.

L

LAN

local area network.

A short-distance data communications network.

M

master/slave model

The direction of control in a network that implements the master/slave model is from the master to the slave devices.

MB

abbreviation for Modbus

Modbus

Modbus is an officially standardized and open application layer messaging protocol. Modbus offers many services specified by function codes.

S

SL

abbreviation for Serial Line

T

TCP

transmission control protocol

A connection-oriented transport layer protocol that provides full-duplex data transmission. TCP is part of the TCP/IP suite of protocols.

telegram

A data packet used in serial communication.

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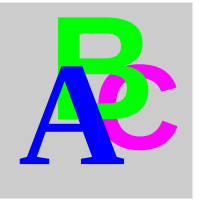

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